

## Further reading on bumble bees and climate change:

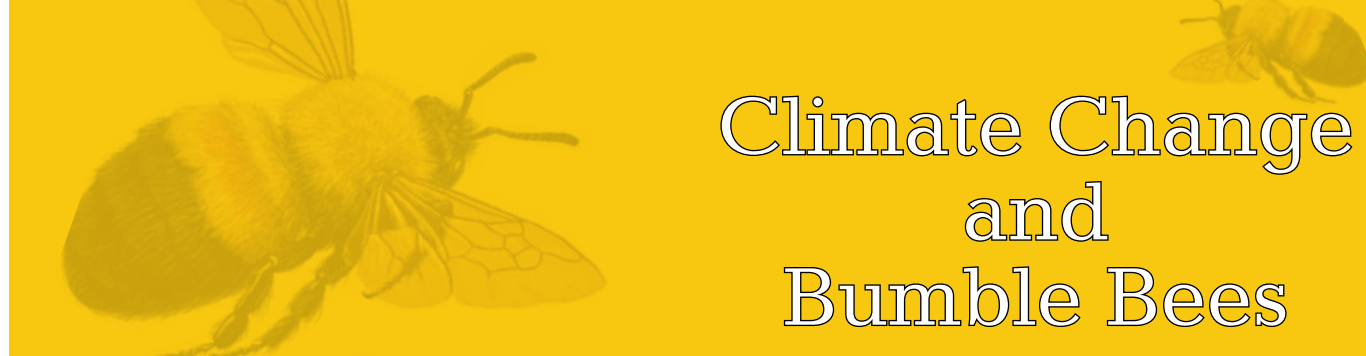
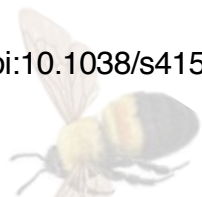
**KERR ET AL. 2015.** Climate change impacts on bumble bees converge across continents. *Science*. 349, 177–180. doi:10.1126/science.aaa7031

**OGILVIE ET AL. 2017.** Interannual bumble bee abundance is driven by indirect climate effects on floral resource phenology. *Ecology Letters* 20:1507-1515. doi.org/10.1111/ele.12854

**PYKE ET AL. 2016.** Effects of climate change on phenologies and distributions of bumble bees and the plants they visit. *Ecosphere* 7(3): DOI 10.1002/ecs2.1267

**WOODARD, S. H. 2017.** Bumble bee ecophysiology: integrating the changing environment and the organism. *Current Opinion in Insect Science* 22:101-108. doi: 10.1016/j.cois.2017.06.001

**SIROIS-DELISLE AND KERR, 2018.** Climate change-driven range losses among bumble bee species are poised to accelerate. *Sci. Rep.* 8, 14464. doi:10.1038/s41598-018-32665-y



# Climate Change and Bumble Bees



The North American Pollinator Protection Campaign (NAPPC) is a collaborative body of over 170 organizations that work for the protection of pollinators across Mexico, Canada and the United States.

Content for this guide was assembled by Sheila Colla, Elaine Evans, David Inouye, and Hollis Woodard with input from other members of the NAPPC Imperiled *Bombus* Conservation Task Force.

For more information and to learn about other important pollinators, please contact [info@pollinator.org](mailto:info@pollinator.org) or 415-362-1137 or visit [www.pollinator.org](http://www.pollinator.org)



**NAPPC**



Photo: David Inouye

Prepared by the Imperiled *Bombus* Conservation Task Force of the North American Pollinator Protection Campaign (NAPPC)

*Climate change is real and is already creating real challenges for bumble bees. We can help bumble bees and other pollinators survive by planting flowers that are drought-tolerant, frost-resistant, and provide a series of blooms throughout the season. We also can help bumble bees by reducing carbon emissions and stabilizing the climate.*



## Bumble bees are essential pollinators in cooler parts of the world

Bumble bees are fuzzy insects that are most common in areas with four seasons. They are found as far north as the arctic, as far south as the tip of South America, and as high in altitude as flowers grow on mountains. They are less common in hot, tropical climates.

One reason bumble bees are more common in cooler climates is that they are cold-adapted. This means they have unique adaptations, the most obvious being their thick, fuzzy hair, to keep warm when it is cold. These adaptations can also make them less able to cool off in warm temperatures.

Bumble bees and flowering plants have co-evolved over many years. While gathering pollen and nectar from flowers, bumble bees pollinate them by moving pollen from plant to plant. Pollination services of bumble bees are critical to sustaining natural ecosystems and many agricultural crops.



A common eastern bumble bee, *Bombus impatiens*, coated with sunflower pollen.  
Photo: Elaine Evans

## Climate change negatively impacts bumble bees and the flowers they pollinate

Climate change effects include warmer temperatures, less snow cover, more frequent droughts, and less predictable frost and flowering times.

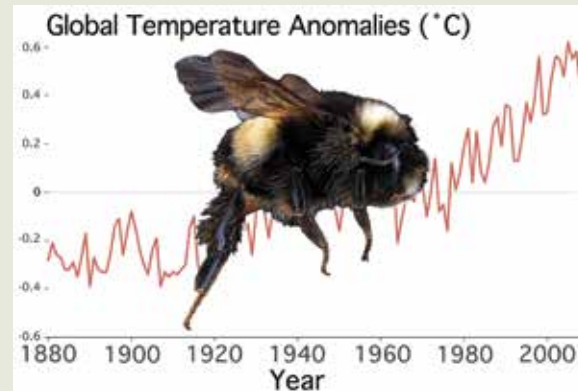
Climate change can lead to timing mismatches between bees and flowers. For example, glacier lilies in Colorado now bloom several days earlier than a few decades ago. They may bloom before bumble bee queens emerge in spring and may not be properly pollinated. The bloom mismatch is also not good for hungry bees that are emerging and find that flowers in are in short supply.

A recent study showed that bumble bees are disappearing from the warmer, southern parts of their ranges due to climate change. However, they are not shifting their ranges to the cooler north. Many bumble bee species could be squeezed out of suitable habitat as climate change proceeds. The intolerance of bumble bees for extremely warm weather is one reason why they are often more threatened in the warmer parts of their ranges.

Bumble bees are adjusting by moving up in altitude in mountain areas into areas that already have their own bumble bee communities with different species. What will happen when they run out of new elevations where they can move? They will probably either face increased competition, extinction, or both.



Glacier lilies, *Erythronium grandiflorum*, are sometimes blooming before their pollinators have emerged from hibernation. Here the flower is visited by a two-form bumble bee, *Bombus bifarius*.  
Photo: David Inouye



## What you can do to help bumble bees survive

- Conserve and create high-quality bumble bee habitat in your local area.
- Plant native flowering plants, especially those that are frost and drought tolerant. Ensure you have a diverse plant selection, providing both early and late blooming nectar and pollen sources.
- Submit bee or nest observations to BumbleBeeWatch.org or use the free BumbleBeeWatch phone app. Make sure to note the type of flower each bee is using. You will help scientists track range shifts and food sources for North American bumble bees.

## Plant resources

Here are a few drought- and/or frost-tolerant plants that can provide resources for bumble bees in areas under climatic stress. Other appropriate flowers can be found by consulting with local, native plant producers.



**Bluestars** are early-blooming cold- and drought-tolerant plants. Pictured here is *Amsonia tabernaemontana* being visited by a brown-belted bumble bee, *Bombus griseocollis*.  
Photo: Heather Holm



**Asters** are drought-tolerant fall blooming plants. Pictured here is New England aster, *Symphyotrichum novae-angliae*, being visited by a common eastern bumble bee, *Bombus impatiens*.  
Photo: Elaine Evans



**Larkspurs**, *Delphinium*, are frost resistant flowers that bloom in late spring to early summer. Pictured here is a yellow-fronted bumble bee, *Bombus flavifrons*, on Nuttall's larkspur, *Delphinium nuttallianum*.  
Photo: David Inouye



**Blazing stars** are drought-tolerant mid-summer blooming plants. Pictured here is rough blazingstar, *Liatrias aspera*, being visited by a lemon cuckoo bumble bee, *Bombus citrinus*.  
Photo: Heather Holm



**Beardstongues** are drought-tolerant plants that flower in late spring. Pictured here is slender beardtongue, *Penstemon gracillis*, being visited by a black and gold bumble bee, *Bombus auricomus*.  
Photo: Heather Holm